



View of the Comares Tower
Source: M.L. GutiérrezCarrillo

The Alhambra master plan (2007-2020) as a strategic model of preventive conservation of cultural heritage

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ABSTRACT

The preventive conservation of cultural assets involves a strategy to analyse and control the factors which cause their deterioration. The main aim is to guarantee their stability and the sustainable maintenance. The Alhambra and Generalife Site has been exposed to numerous risk factors over time which have left their mark on its fabric. On some occasions these have had serious effects which now present significant challenges for the comprehensive conservation of assets at the Site. During the twentieth century the Alhambra became a preserve for which a set of conservation and maintenance plans were developed, the first of which was the Special Protection and Interior Reform Plan for the Alhambra and Aljares (1987). Subsequently, the current Alhambra Master Plan (2007-2020) was instigated.

This paper examines the plan's innovative methodological approach and its proposals regarding preventive conservation in circumstances under which its location precipitates natural and anthropic risks, and which are specific to its history and physical condition, its fragile materials and increased pressures on it from mass tourism.

KEYWORDS

Preventive conservation, risk, world heritage site

1. INTRODUCTION

The current working model of Cultural Heritage demands its protection, conservation and safeguarding, that it is improved on an ongoing basis, leveraged as a social asset and has a role in sustainable development (AHHL 14/2007). However, as this heritage is at risk from various natural and anthropic elements which could compromise or aggravate its state of conservation, any definition of preventive conservation and maintenance strategies (UNESCO 2000) (Vantaa 2000) must incorporate contemporary models of heritage conservation.

Recently, heritage practice has been prescribed by Preventive Conservation methodologies which focus on vulnerabilities, risk detection and control at cultural heritage structures. The aim is to minimise the risks, to avoid the structures' deterioration or loss and reduce the cost of restoration works (IPCE,

2011:3) by assessing the degree to which these risks result in damage and addressing the causes. This methodology (Herráez, Durán & García, 2018) applies a multidisciplinary analysis to each cultural asset, its state of deterioration and its usage and management; it examines the factors affecting it, makes an assessment and determines the priorities; monitoring /control methods are designed and the technical procedures are described, alongside a maintenance programme and other preventive actions. These are all underpinned by quality control and continuous improvement criteria (Herráez, 2018: 75).

Via its delivery of the Master Plan, The Alhambra and Generalife Monument Site has pioneered in the articulation of a heritage management model founded on the principles mentioned above. A study of it and the resultant findings allow for a model to emerge which can be extrapolated for use at other monuments which share its characteristics.

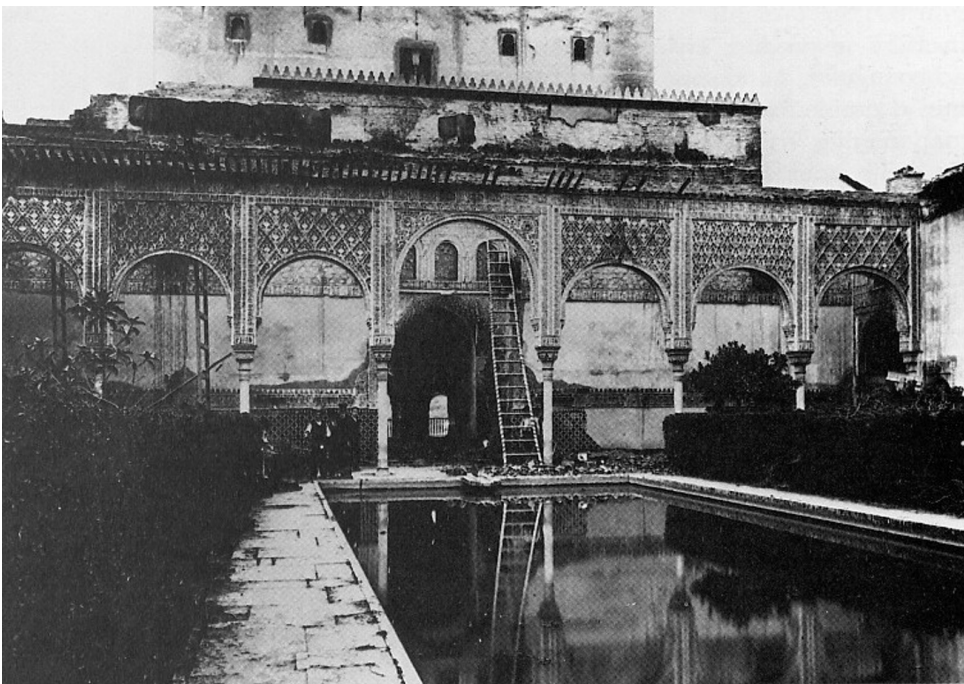


Figure 1.
Fire risk which had affected the Sala de la Barca in 1890. (source: APAG/ Colección Fotografías/ F-13115).

2. CONSERVATION OF THE MONUMENT SITE: HISTORICAL ANTECEDENTS

The geographical configuration of the Alhambra and Generalife Monument Site means that it goes beyond the conventional notions of a historic and symbolic palatial walled city. Its characteristics as urban settlement set on the Sabika hillside and its location in a terrain defined by two fluvial channels, the Genil River to the South West and the Darro River to the North East (Bermúdez, 2010) are elements which have determined both the genesis and the evolution of its structure, as well as the risks to which it has since been exposed. Since its origins, different factors have inflicted changes on the monuments. From the sixteenth century it was the subject of ongoing conservation efforts overseen by those tasked with its management, in order that it "should always remain in perpetual memory" (Galera Andreu, 2000). Maintenance works have inherently involved consolidation and restoration processes (Muñoz Cosme, 1991).

The risks have been broad and the effects, varied. The report by Juan de Minjares, master builder at the Alhambra, makes reference to human causes of damage to the site as the result of badly conducted repairs and the fact that some of the towers were used as living quarters. However, one of the greatest sources of damage was the explosion of a gunpowder factory located near the Church of Saint Peter in 1590, the effects of which were described by Juan de la Vega (Bermúdez Pareja, et al, 1966). The list of damages included broken glass, flooring, tiles slipping from the rooves, and the detachment of plaster, wall tiles and leaded glass. The shockwave affected the enclosure walls, and doors and windows of the buildings on the northern wall. However, despite the enormity of the explosion, the only significant damage was to the Muqarnas Hall in the Palacio de los Leones (the Lion Palace). Its vault collapsed and years later was rebuilt using plasterwork which differed from that used in the original one by the painter Blas de Ledesma (APAG. Legajo 153-1). The report from the master builder Juan de Orea in 1572 again tells of how the towers were used as dwellings and cites this as the reason why panels were collapsing and being rebuilt

(Cruces, et al, 2001). He also mentions the inadequate maintenance of water channels and their consequent deterioration leading to leaks and water retention in an adjacent area which affected the south eastern bastions. He additionally criticised the managers for being incompetent when in 1634 the master builder Francisco de Potes ordered that the portal pool be drained, which led to a water basin forming in the northern sector and a considerable part of it to subsequently collapse.

Napoleonic occupation of the Alhambra meant its military context had a greater role to play. With their retreat in 1812, the French army tried to demolish the walled city. Fortunately they failed, thanks to the action of corporal José Garcia, who threw himself on the fuse before it reached the Puerta de la Justicia (Gate of Justice) thus saving it from destruction.

Then there are the natural risks which include earthquakes and the numerous overflows of the Darro River. Between 1478 and 1951 the river burst its banks more than twenty times. In 1600 the water level and force of the current washed away the left shore of the river causing the wall which bordered the Tajo de San Pedro (Saint Peter's Gorge) to slip (Chamorro, 2008).

In 1870 the site became public property; plans and reports were drafted which recognised its state of conservation and proposed different levels of intervention. The General Conservation Plan by Ricardo Velázquez Bosco in 1917 (Vílchez, 1990) was particularly pioneering and innovative. This outlined "a plan subject to which there will be ongoing, regular and constant work which is conscious of its archaeological-artistic nature" and made assurances that the conservation and maintenance works would not entail large or costly restoration projects. It was recommended that occupation of the top floor of the Torre de la Justicia (Tower of Justice) and other areas used as dwellings should cease as they were prejudicial to the monument's conservation. The demolition of recent constructions which were threatening to bring down walls and ceilings to the entrance to the Mexuar Palace was recommended and it was stated that the works proposed by the Plan were "exclusively for conservation, in order to contain the ruin and to the exclusion of all else unless concerned with restoration" (Vílchez, 1990).

The Archives mention a concern about a possible

fire risk, given that it had affected the Sala de la Barca (Boat Hall) in 1890 (Fig.1). The installation of a "system of electric pumps" was recommended, which would be connected to a wider network, a mobile system of gasoline-powered motors and centrifugal pumps together with portable equipment, hoses and fire stairs. The system is thoroughly detailed as are the provisional uses of some of its elements, thus evidencing the importance which Velázquez Bosco ascribed to having a rapid response mechanism to respond to incidents: "The Arrayanes patio pool and that at the Torre de las Damas (Ladys' Tower)(...) can serve as water deposits which can be refilled in case of fire (...) it not being necessary to build a deposit especially for that purpose". (APAG, Legajo 341)

It would be Leopoldo Torres Balbás who put the greatest part of Velázquez Bosco's Plan into effect by taking on the challenge of carrying out interventions at the monument using a scientific approach and to make it suitable for public visits. Francisco Prieto-Moreno continued this task between 1936 y 1975, although with a different focus and solutions (Romero, A., 2014).

3. PREVENTIVE CONSERVATION IN THE SPECIAL PROTECTION AND INTERIOR REFORM PLAN FOR THE ALHAMBRA AND ALIJARES (1987)

Following the adoption of the Spanish Constitution in 1978 and the transfer of responsibility for Cultural Management to the Autonomous Community of Andalucía in 1984, the monument's governing body made strides towards adapting to the country's new political and administrative landscape with the creation of the Alhambra and Generalife Trust in 1985 (enacted in its Statutes in 1986). It was afterwards declared a Good of Cultural Interest under the Historical Heritage Law of 1985 (SHHL, 1985) in the Artistic-Historical Site category, a title which was changed in 2004 for the more appropriate term, "Monument". Also, during this period, UNESCO included it in its list of World Heritage Sites (16th of November 1984), highlighting

it as an example of a preserved Western Islamic Palace City maintained and conserved over time as one of its exceptional universal values. This declaration by the internationally recognized authority came with the additional advice that the Spanish authorities should take urban pressures on the Monument Site into account and made recommendations regarding the sustainability of its use.

The main purpose of the Special Protection and Interior Reform Plan for the Alhambra and Alijares (Seguí, 1986), was to streamline the complex management process of the Monument Site in cooperation with local and regional administrators in order to preserve its physical characteristics and landscape in the context of its urban setting in the city of Granada. It was executed quickly in order to prevent a private firm building a luxury housing development in the Alijares sector of the Monument's protected area between 1980 and 1981. The regional government of Andalucía stopped the project on the basis that it would cause irreparable damage to the site's characteristic landscape and environment and pushed for the Special Plan to be drawn up. This approach was exemplar of the Andalusian administration's determination to conserve and protect the monument. It was consequently incorporated as part of its own lands and a "buffer" zone was included in the Alhambra and Generalife World Heritage record.

The Plan (1987-89) took the monument's site in an urban setting into account and outlined its protection, use and purpose, with its geography being the key element. It proposed installations which were conscious of the Alhambra's context as a historical city within a city, Granada, the boundary of which had deteriorated and was in need of attention. It addressed access issues by creating and increasing pedestrian access to the entire area, and even considered a full pedestrianisation of the enclosure; vehicle access was created to the south for both light and heavy vehicles, thus addressing the issue of environmental contamination. A qualitative and quantitative analysis of the architectural structures' condition was also carried out in order to assess their state of conservation. Some of the damage which was described included cracks and fissures, warping and collapse.

The Plan's Progress Report included a geotechnical assessment of heritage conservation for the first time. The materials which compose the area and the ground on which it rests were analysed and classified as natural or artificial surface coverings or as the so-called Alhambra which, due to its composition, was fundamental to the stability of the monument site. A study of the surface and subterranean hydrology included how surface drainage on more even topography could be optimised by identifying areas subject to pooling. Subterranean drainage occurs via layers of sand and loose conglomerates separated from each other by impermeable red clay. The possibility that there were pockets of groundwater trapped between the sand and conglomerates which were being replenished by rain, infiltration, or leaks from water systems or water deposits was also suggested.

The study considered the relationship between seismic activity and building processes, which used as its starting point the "Overall map of seismic zones in the southern region of the Iberian Peninsula", on which Granada appears with a magnitude of VII. The history of seismic activity was also studied. This included 1640 recordings between 365 and 1976, as recorded by the National Geographic Institute. The report highlighted risks to the stability of the hillside and slopes, mentioning the Tajo de San Pedro (St Peter's Gorge) as being in need of attention.

Tourist and cultural use of the Alhambra and the quality of visitor's experience were central to the development of the Special Plan. As a result, the Trust was steered towards applying sustainable crowd management systems which recognised the heritage's vulnerability and the need for tourism to be compatible with the environment, the society and the economy (Troitiño, 1999). By limiting capacity and the number of visitors, varying what was on offer for the tourist and by continuous monitoring, the Alhambra emerged as a model of comprehensive management which has been recognised by UNESCO as an example of best practice (Chamorro, 2000).

4. THE ALHAMBRA MASTER PLAN (2007-2015 AN EXTENDED UNTIL 2020) AND PREVENTIVE CONSERVATION: DEFINITIONS AND DEVELOPMENT

The Alhambra and Generalife Monument Site is a prime cultural tourist destination in Spain that has received over two and a half million visitors over the last decade. Its cultural features and the fact it is extremely popular have led the Trust to outline a model of sustainable usage on the basis of preventive conservation. Visitor routes are planned, capacity is controlled, the load capacity is defined, the flow of visitors is optimised for both security and conservation, crowds are studied, the quality of the service provision is assessed and the direct, indirect and induced economic impact to its immediate surrounding area are measured (Fig. 2) (Villafranca, 2008).

Management of a cultural asset is by its very nature so complex that it should take both a wide perspective and a comprehensive and integrative approach which acknowledges "prior works which have been carried out (...) provide the best guarantee that any new actions which are proposed are coordinated so as to produce (...) a natural and logical evolution in how processes are updated and instrumental improvements in management are made. Others consist of (...) innovations which meet the requirements of the changes needed" (Villafranca, 2008). The Alhambra Master Plan (2007-2015) responded to these points and has been extended until 2020. It is a methodologically innovative plan as it was developed and written by specialists and because stakeholders and civic groups participated in the discussions and made enriching contributions.

It consists of four strategic lines of action, (Preservation, Cultural Landscape, Sustainability and Community Information and Knowledge) and one hundred and fifty-four measures which were outlined in programmes and subprogrammes which define and develop the proposals. Also identified by these were the human and material resources, the anticipated results, favourable and unfavourable conditions, possible sources of conflict, antecedents, priorities,

internal and external responsible or involved agents, a timeline for each measure, its degree of priority, a viability assessment, assessment indicators and measures which address each proposal in terms of their logical association and coherence with the rest of the Plan.

A primary objective was to create a georeferenced (GIS) map to be used as a standardised tool for creating qualitative information records. The Cartographic Atlas of the Alhambra was a comprehensive response which linked its area, its cultural value, and its features to the Alhambra Information System (SIALH) (Fig 3) (Villafranca et al., 2012).

The Master Plan considers a range of studies of natural and anthropic risks to the asset's structural conservation. Above all, it considers the landscape at the Monument Site in which stretches of woodland, cultivated areas, low mountain vegetation or repopulated pine trees are all particularly vulnerable.

It proposes that assessments should be carried out to determine the state of conservation of the structure's characteristic elements, which are those included in the Alhambra Catalogue. These assessments are to be approached from the perspectives of culture and nature and which would use the Guide to the Alhambra Countryside and the descriptive mapping instruments referred to previously. The Master Plan innovatively widens the definition of Cultural Assets in the protected area to include the ethnographic dimension.

The Plan makes a commitment to draft a conservation and restoration map of the Alhambra (Fig. 3) which would compile the methodologies, diagnoses, techniques and new approaches from all the relevant scientific, technical and humanities disciplines as well as determine the scope of the projects, their programming and dissemination. The fact that the Monument has a responsibility to act as a model for

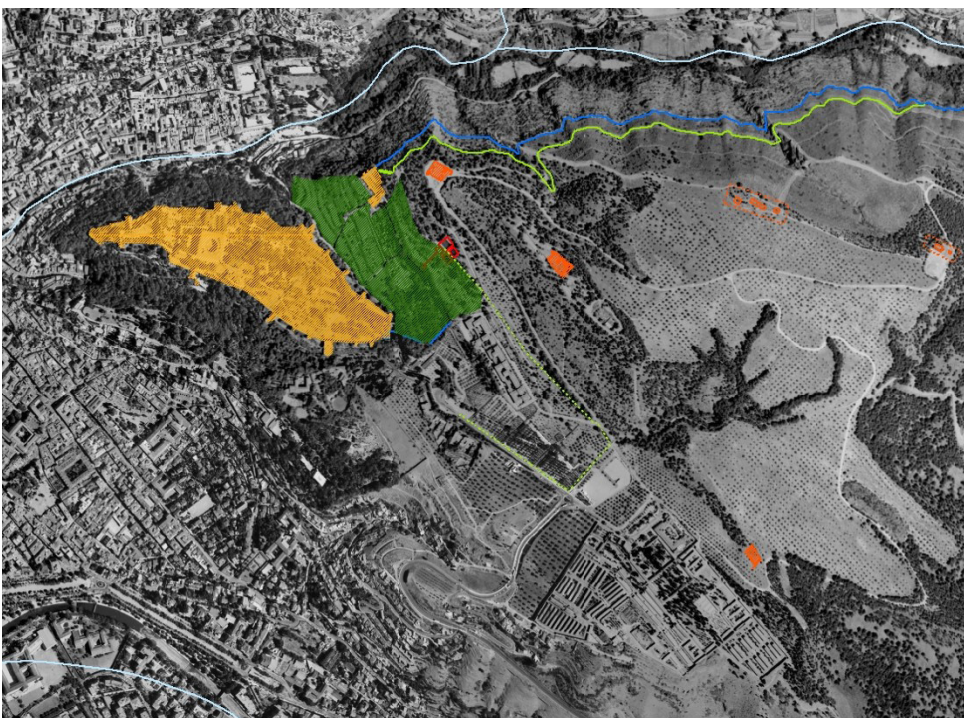


Figure 2.
Surface of the Master Plan indicating perimeter Alhambra, Generalife, Dehesa and Acequia Real (source: Mar Villafranca).

management on a national and international stage is also highlighted. A quality control system is outlined which takes the points mentioned above as well as the uses and purposes of the cultural asset, the advancement of preventive conservation, specific risk prevention measures and security into account. Amongst the measures which address the conservation of built assets, express reference is made to the requirement for a "preventive conservation strategy". This would be based on methodologies and systematic maintenance protocols which attenuate the anthropic risks arising from visitors behaving inappropriately. As regards the Alhambra Museum collections, a Preventive Conservation Plan has been considered by which a systematic strategy of risk management and control for the collections is defined (Fig. 3). The aim is to avoid and minimise the factors associated with the deteriorative processes that affect the collections and to implement controls by monitoring the conditions in the museum to ensure that they are stable and optimal for conservation (Herráez et al., 2018). The strategic lines contained in the Alhambra Master Plan, the Alhambra as a cultural landscape and sustainable use of the Alhambra contains the main points regarding Preventive Conservation and has a focus on innovation.

The landscape indicates the quality of a specific physical environment. The condition of the Alhambra and Generalife landscape and the comprehensive approach to its management promulgated in the Master Plan gave rise to programmes and initiatives which focused on assessing the natural and anthropic risks. As a consequence of the earthquakes in Italy in 1980, the need to have Risk Maps available as a tool for managing cultural assets became even more pressing. Consequently, in the last third of the twentieth century, risk analysis was incorporated as a planning instrument (Baldi, 1992). The Alhambra Master Plan makes specific and explicit reference to this: "taking action to address risks means anticipating the damage that can occur to cultural assets; this requires using predictive techniques and mapping tools with associated databases, mainly indicators and statistical procedures, to assess the impact of particular events" (Villafranca et al, 2010).

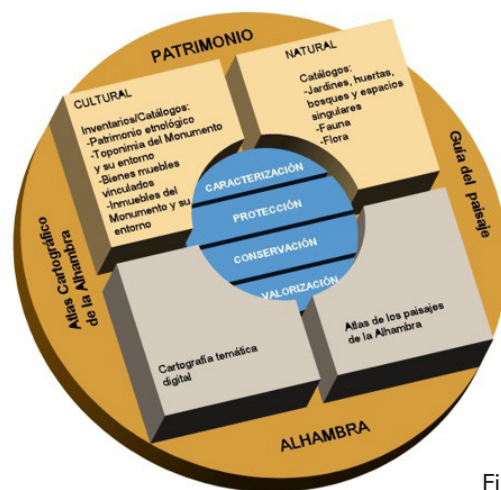


Figure 3.
Structure of the Master Plan
2007-2020
(source: Mar Villafranca).

5. MASTER PLAN RISK MANAGEMENT STRATEGIES

Firstly, the different types of risk which could affect the delicate balance between the natural environment and human activity were identified. Secondly, a series of strategies were developed to address them. These are presented in the following summary:

5.1 SEISMIC AND HILLSIDE MOVEMENT

Over time, the Alhambra has accumulated damage to its structure as a result of recurrent seismic activity and which has destroyed extensive areas, such as the Alijares Palace in 1431. The effects on the Alhambra's architectural structures are still visible in the form of fissures and deformations. These, together with the indices of instability of some of the hillside on which the walls rest, led the Alhambra and Generalife Trust to sign an agreement with the Centre for Research and Testing of Public Works (CEDEX) to carry out a geomorphological and structural analysis of the

Figure 4.
View of the Alhambra from the Albaicín. Materials of the walls and Tajo de San Pedro (author: Pepe Marín).



Monument Site and make a geotechnical assessment with regards to its conservation. In order to assess structures' stability a scientific approach was taken by which specific strategic points were tested and measured, such as at the highest towers in the enclosure, the Torre de la Vela or the Torre de Comares (Comares Tower) (Fig. 4), other walled structures or their supports, and their behaviour and causes were observed and monitored virtually (Cuéllar, 1997-1998a; Cuéllar, 1997-1998b). This pioneering work was the starting point from which projections and ongoing assessments of the architectural structures' vulnerability to seismic activity were made. Most significant was the fact that it acknowledged that these structures had not remained unchanged during the course of their history. For example, the use of novel materials during restoration makes diagnosis vital so as to determine the best course of action

and protocols to secure, reinforce and stabilize the structures.

As regards the risks from movement of the hillside, the clearest example is the destabilization of the Tajo de San Pedro (St Peter's Gorge) (Fig. 3). Studies carried out by the University of Granada and Geological and Mining Institute of Spain technicians concluded that the escarpment could have receded between 78 and 185 mm per year, although the majority of the movement had occurred between the sixteenth and the nineteenth centuries. The Trust has work pending in the area, by which a flexible structure such as metal netting will be directly attached to the wall but will not affect the existing vegetation, allowing its regrowth and its integration in a manner analogous to that by which was carried out to the sides of the Generalife which connect to the Cuesta del Rey Chico (Durand et al, 2006).

It should be pointed out that the erosion of the Alhambra hillside may be as a result of its own dynamic history. Its ability to support a permanent load should be assessed as there could be an impact on the cement crowning of towers and walls.

5.2 CLIMATE CHANGE - DESERTIFICATION

The main indicator of how global warming (Puccio & Simeoni, 2015) is affecting the Monument is the loss of vegetation. This loss is caused by accumulated periods of intense drought and disasters of human origin, specifically forest fires which have been numerous in the last decade. These reduce the degree to which the ground is protected and increase the risk of surface runoff. The Master Plan includes a provision for a desertification risk map to assess soil degradation and the damage to different species of tree and vegetation in the area. It also examines the causes of the loss of vegetative cover and how to ameliorate the serious economic and environmental effects that drought has had on the Alhambra landscape. The proposals include the introduction of a drought monitoring programme which will use both direct observations and measurements from instruments.

Another risk associated with climate change comes from plagues and sickness. These affect the plants in the woods and gardens of the Alhambra and indicate that there is an imbalance in its biology and within different ecosystems. The sustainable ecosystems project contained within the Plan outlines how to control this element and describes how scientific understanding and methods can be used to determine which are the least damaging chemical treatments that can be applied given the area's ecosystem.

The marks of climate change are visible on the walls and rooves of structures at the Alhambra as a result of the uncontrolled spread of parasitic plants and from the effects of cracks and fissures caused by freezing winter temperatures. The PAG Conservation Service maintenance programme uses systematic protocols which are intended to ameliorate the effects, which would otherwise put the conservation of the fragile architecture in the Monument Site at great risk.

5.3 RISK OF FIRE

Both the extensive forest at the Dehesa del Generalife which adjoins the Monument and the construction materials used in the architecture are both at risk from fire due to drought and human activity, particularly in summer (Villafranca et al, 2013). The Master Plan calls for a retrospective assessment of the circumstances which have presented the greatest risk of fire in the last few years, the identification of their causes and their effects.

This would inform an action plan in which protection systems would be designed around the water resources available and a new water deposit and associated infrastructure in the suburban Dehesa area would be provided to ensure easy access by fire control operatives (Fig 5).

Studies have identified the areas which are at greatest risk, and some preventive measures, such as the restriction of any activities which could further provoke fire (for example bonfires from cuttings or barbecues in the recreational areas of the Generalife Dehesa Park), are immediately available. Additionally, the General Security Plan, launched in 2011, guarantees effective and responsive coordination with the preventive and emergency services in Granada. The preventive measures include the provision of an environmental education programme for employees, visitors and residents in order to raise awareness of the consequences of carelessness.

5.4 URBAN PRESSURES

The Alhambra's urban setting in Granada and its clear significance in the landscape needed to be reiterated by the both Master Plan and in the guidelines used to revise the Special Plan, in order to increase its protection. One example includes a project to have the Valle del Darro declared to be A Good of Cultural Interest in the Heritage Area category. Consequently, the threat from speculative housing developments in a culturally important landscape could be prevented. Projects such as the completion of Granada's ring road (Fig. 6), which would be to the detriment of lands adjacent to the source of the Darro River, or the



Figure 5.
Aerial view with Generalife Dehesa Park
(author: Miguel Ángel Molina).

plan to build a large reservoir at its head, are just two of a series of threats to this unique Monument Site. Although it is more protected in law today than in the past, threats still remain.

5.5 PUBLIC VISITS AND SUSTAINABILITY

Other threats include the increased pressure from tourism between the 1970s and the twentieth century (Troitiño, 1995; Revilla, 2001; Chamorro, 2006) and above all, from the increase in organized tourism during the first two decades of the twenty first century (Troitiño & Troitiño, 2010) (Fig. 7). A change in leisure travel tendencies, exemplified by the so-called "express tourism" from the Costa del Sol and the "cruise ship tours" which port in Almeria, Malaga and Motril have been visibly on the increase since 2009. Additional threats include attempts to increase the urban spread, an increase in incompatible usage of the area around the Alhambra in the twentieth century, attempts at profiteering from this heritage by certain sectors whose motive is purely financial, and the visibly obvious damage that excessive or poorly managed tourism has on heritage conservation (Troitiño, 2000; Villafranca, 2008).

The Master Plan's Strategic Line "Sustainable Use" is intended to facilitate "balanced, sustainable and comprehensive" management, meet the strategic objective of designing public policies which strike a balance between heritage conservation and economic benefits, and advocates for comprehensive heritage management which inclusively addresses aspects such as tourism, conservation, research, publicity, culture and education.

Guidelines for how to achieve this are laid out in the other specific objectives, which relate to improving the visitor experience. Of these, the following should be highlighted: foster interest in the Alhambra as a Landscape of Cultural Value; enable tourism planning and diversify the offering; be open to community / civic participation and collaborations with other institutions; instigate an ongoing line of work with the tourism industry in order to directly engage with them in the separate areas of publicity, awareness building and visitor loyalty.



Figure 6.
*Projects such as the completion of
Granada's ring road
(source: Mar Villafranca).*

The diagnostic analysis which was carried out as a precursor to the Master Plan revealed that particularly during the high season, the unique opportunity which a visit to the Monument Site presents, creates a demand that far outweighs an offer which restricts the number of visitors and capacity in the Nazaries Palaces.

The Sustainable Use of the Alhambra strategic line was based on a detailed analysis of how its spaces are used and with regards to the tourism activities promoted by the Trust. This latter element conferred it with the role of an international leader in how to manage the flow of tourists and how to determine capacity in its spaces, especially in those areas with are the most in demand by visitors and concurrently the most fragile. The Master Plan proposes that the system which limits capacity should be continued in order to guarantee preventive conservation. Furthermore, it encourages the diversification and broadening of the tourism and cultural offering. This strategy intends to enhance the historical, artistic, symbolic and landscape value of the Monument Site and improve the way in which its heritage characteristics are perceived and enjoyed. The Plan includes different thematic routes which pass through both the internal and external spaces and which offer a new way of viewing and enjoying the urban and country locations of the Alhambra.

A network of lookout points was also created in the Albaicin from which the exterior of the Monument Site could be seen. These were located according to the sights that were recorded by travellers during the Romantic period. This initiative was undertaken thanks to the agreement signed with the Albaicin Foundation, even though in practice it has not delivered the hoped-for results. The findings from surveys of the public and their stated preferences, suggested that what was available with the gardens entrance ticket could be improved and broadened with a-la-carte visits to include a night visit to the Palace and the Generalife gardens, a specific offering for families and another one for the population of Granada and its province. Public visits now provide an enhanced cultural experience of the Alhambra using technology. This makes information accessible to or adapted for a diverse public, from those using the educational service for school children to other groups with the right to adapted support. The challenge to make the Alhambra more accessible to the public and more sensitive to wellbeing in society while keeping its characteristics and the heritage value of its architectural arrangement and its spaces in mind will need to be addressed in the coming years. The Alhambra Oculata (Hidden Alhambra) Project was designed to provide a virtual experience of spaces which, due their state of conservation or because of access limitations, could not be included as part of the walked routes, (these are available at www.alhambraoculata.es).

The Plan proposed that the visitor Study Group should be better supported and that data analysis and improvements to the prior reservation and capacity management systems should be carried out to improve the sustainability of the model already in place in Granada during the tourist season. This model has successfully extended the season to eight months a year without the need to increase the visitor quota, simply by managing the process optimally. The combined deployment of these measures was intended to ameliorate the negative effects of public visits on the conservation of the Monument's architectural elements' and environment.



Figure 7.
Example of tourist overcrowding.
(author: Pepe Marín).

However, in 2018 the visitor limit of 2,700,000 was almost reached - if the number of permitted visitors is not reviewed and an up-to-date measurement of the load capacity at the Monument site is not done, the Alhambra will again be put at risk.

6. CONCLUSIONS

The Alhambra Master Plan (2007-2015 and extended until 2020) has meant that management of the Alhambra during the last decade has adopted scientific and technical criteria and been conscious of the risks to its preservation. Although it has been executed in an inconsistent manner, it is nevertheless a hugely valuable Management Document which has received numerous national and international awards, including the European Union's Europa Nostra Award in 2009.

The Alhambra is unique; it is a living monument and an inhabited site which has remained in use and active over the years. However, to a large extent, its status as a tourism resource has been the cause of ongoing disputes. These issues can only be addressed from the perspective of sustainability, to do otherwise would present a risk of grave concern to both its conservation and legacy for generations to come.

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